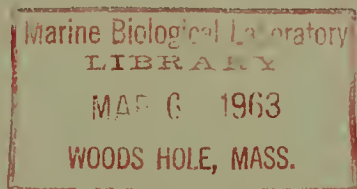


**ANNUAL FISH PASSAGE REPORT
ROCK ISLAND DAM
COLUMBIA RIVER, WASHINGTON
1961**



SPECIAL SCIENTIFIC REPORT-FISHERIES No. 421

**UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE**

UNITED STATES DEPARTMENT OF THE INTERIOR, Stewart L. Udall, *Secretary*
FISH AND WILDLIFE SERVICE, Clarence F. Pautzke, *Commissioner*
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ANNUAL FISH PASSAGE REPORT - ROCK ISLAND DAM COLUMBIA RIVER, WASHINGTON, 1961

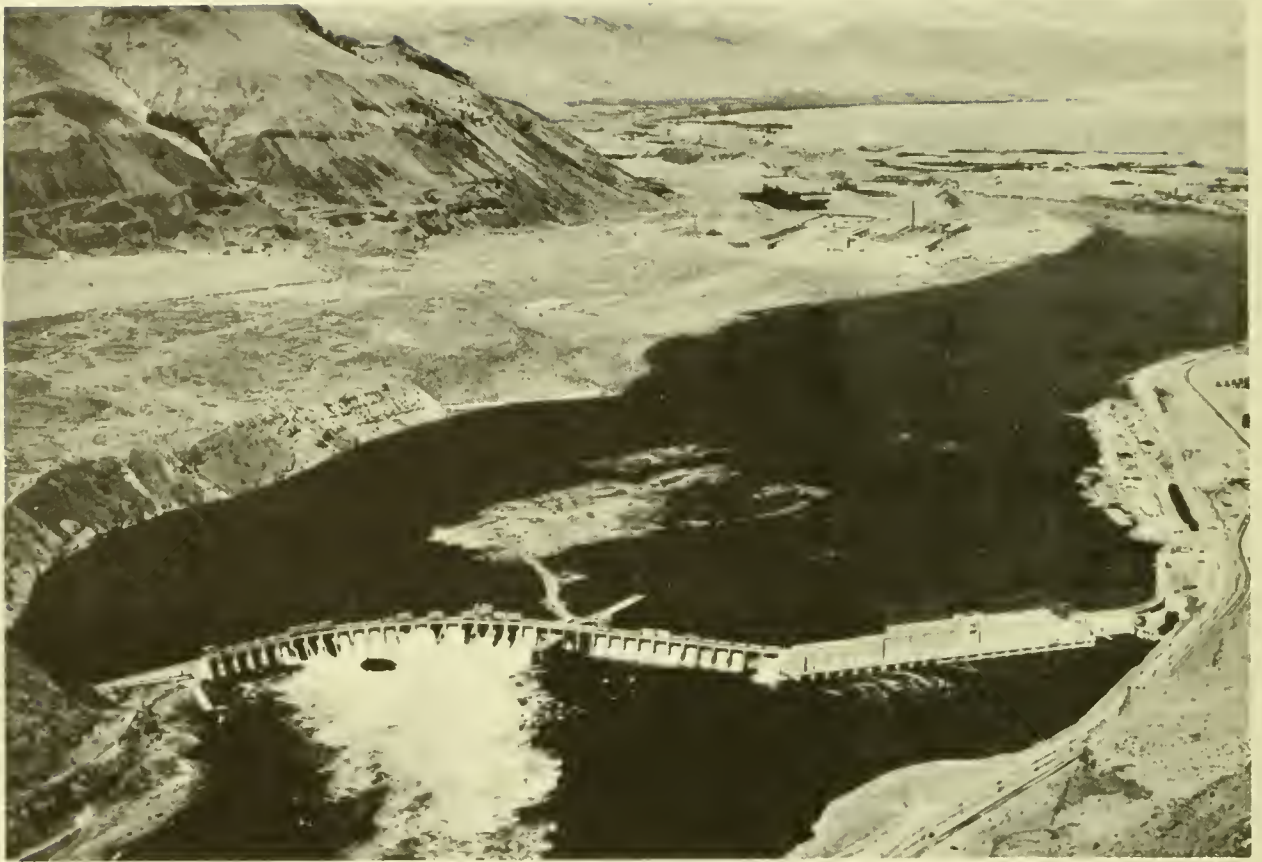
by

Paul D. Zimmer and John H. Broughton



United States Fish and Wildlife Service
Special Scientific Report--Fisheries No. 421

Washington, D. C.
April 1962



Rock Island Dam, Columbia River, Washington

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ANNUAL FISH PASSAGE REPORT - ROCK ISLAND DAM COLUMBIA RIVER, WASHINGTON, 1961

by

Paul D. Zimmer, Fishery Biologist (Management)
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ABSTRACT

Important runs of salmon and steelhead trout pass Rock Island Dam on the Columbia River.

Count of 33,067 chinook salmon in 1961 was well above the mean of 15,560 for the 28-year period 1933-60 and exceeded the 1960 count of 26,532. Sockeye salmon count of 19,233 was slightly more than one-third the 28-year mean of 53,079. Only 50 coho salmon were recorded in 1961. Greatest number of coho salmon, 229, occurred in 1947. The 7,042 steelhead trout passing Rock Island Dam in 1961 was the highest count recorded since counting began in 1933 and was more than twice the 28-year mean of 3,063. 140,173 fish other than salmon and steelhead trout passed through the fishways at Rock Island Dam in 1961.

INTRODUCTION

Rock Island Dam, located on the Columbia River approximately 12 miles downstream from the city of Wenatchee, Wash., has been in operation since 1933. The plant is owned and operated by Chelan County Public Utility District No. 1.

This report on passage of fish at Rock Island Dam during 1961 provides information on operation of fishways and numbers of fish utilizing upstream fish passage facilities.

Rock Island Dam is now equipped with three fishways: one located on the right bank,

another on the left bank, and the third approximately in the center of the dam. Two of the fish ladders were placed in operation in 1933, and the third (middle ladder) was constructed in 1935-36. All three ladders have undergone significant modifications since initial construction.

Included in this report are comments covering various investigations carried on at Rock Island Dam during 1961.

COUNTING PROCEDURES

Fish counting in 1961 began on May 1 and terminated on October 27. From May 1 to August 19, counting was conducted 16 hours each day, starting at 5 a.m. and ending at 9 p.m. From August 20 to September 30, to

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conform to hours of daylight available, counting was reduced to 14 hours each day, starting at 5 a.m. and ending at 7 p.m. From October 1 to October 9, counting was further reduced to 8 hours each day, starting at 8 a.m. and ending at 4 p.m. From October 10 to October 27, counting was conducted from 8 a.m. to 5 p.m., with 1 hour closure of gates at noon.

A 15-minute rest period was allowed at the end of each hour, and during all periods of noncounting, ladders were closed to passage of fish.

ENUMERATION OF FISH

Chinook Salmon, *Oncorhynchus tshawytscha*

The chinook salmon count in 1961 of 33,067 (jacks included) was well above the mean of 15,560 for the 28-year period 1933-61. The count increased over the 1960 run and was a little more than half the peak annual count of 50,713 in 1957 (table 1). Monthly totals of chinook salmon counted are given in table 2. Maximum day's count of chinook salmon, jacks not included, in 1961 was 692 on August 7 (table 3). Tables 4 and 5 show semimonthly totals of number and percentage of chinook salmon count which ascended each fish ladder.

Chinook Salmon Jacks

Some chinook salmon return from the ocean during the year following their seaward migration and are referred to as "jacks." These fish are predominantly males and are smaller than the average. It has been determined at Rock Island Dam that up to June 30 of each year, jacks rarely, if ever, exceed 18 inches in length, while the balance of the fish appreciably exceed that length. Likewise, from July 1 to the end of the season, jacks rarely, if ever, exceed 22 inches in length. Consequently, jacks at Rock Island Dam are identified by considering all chinook salmon 18 inches or less in length prior to July 1 as jacks, and all chinook salmon 22 inches or less in length subsequent to June 30 as jacks. Maximum day's count of chinook salmon jacks was 199 and occurred on September 18 (table 3). The 9,260

fish recorded as jacks constitute 28.0 percent of the 1961 chinook salmon run.

Table 5 shows number and percent of chinook salmon jack count which ascended each fish ladder. Monthly totals are given in table 2.

Sockeye Salmon, *Oncorhynchus nerka* (blueback or red)

The sockeye salmon count of 19,233 for 1961 was less than half the 28-year mean of 53,079 (table 1). In 1961 peak of the run was reached on July 14, when 1,289 fish were counted through the fishways at Rock Island Dam.

In recent years attention has been drawn to the many small sockeye salmon appearing at Rock Island Dam. During the 1961 counting period at Rock Island Dam sockeye salmon under 16 inches in length were enumerated as small fish. Number of sockeye salmon recorded as "small" was 3,497 (6.6 percent).

Tables 6 and 7 show semimonthly totals of number and percentage of sockeye salmon count ascending each ladder. Of the sockeye salmon passing Rock Island Dam in 1961, 65.6 percent ascended the left ladder, while 9.9 and 24.5 percent ascended the middle and right ladders, respectively. Data pertaining to sockeye salmon daily counts are contained in tables 9-14. Monthly totals of sockeye salmon counted in 1961 are given in table 2.

Coho Salmon, *Oncorhynchus kisutch* (silver)

The coho salmon count of 50 fish in 1961 was slightly less than the 28-year mean of 61, and slightly more than half the 1960 count (table 1). Additional data are shown in tables 11 and 12. Maximum day's count of 8 fish occurred on October 4 (table 2).

Steelhead Trout, *Salmo gairdneri gairdneri*

The steelhead trout count of 7,042 in 1961 was well above the 28-year mean of 3,063 (table 1).

Additional data pertaining to steelhead trout daily counts are contained in tables 7-12.

Maximum day's count in 1961 was 269 on September 19 (table 2).

Table 6 shows semimonthly totals of number and percentage of steelhead trout which ascended each fish ladder.

Miscellaneous Fish

In 1961, enumeration was made of species of fish other than salmon and steelhead trout passing Rock Island Dam. Data pertaining to these fish are given in tables 15-20. No claims are made as to complete accuracy of identification of these fish. It is felt, however, that the degree of accuracy is consistent with that maintained at other dams on the Columbia River and as such may be used as a rough index of abundance of these fish. In 1961, approximately 140,280 fish other than salmon and steelhead trout passed Rock Island Dam.

WEATHER AND RIVER DISCHARGE DATA

Headwater and tailwater elevations are plotted on figures 1 and 2, respectively. From 1 p.m. on June 9 through June 13 all fish facilities were nonfunctional due to high water. Air temperatures were taken twice daily by pocket thermometer. Water temperatures were taken at center fish ladder by recording thermometer. Daily records of weather conditions and stream flows are shown on tables 9-14. Daily river discharge data are plotted on figure 3.

ACTIVITIES AND OBSERVATIONS

A count of 137 chinook salmon on May 1 indicates that initial movement of these fish probably began prior to that date. This is in striking contrast to the late start of fish on May 18, 1959.

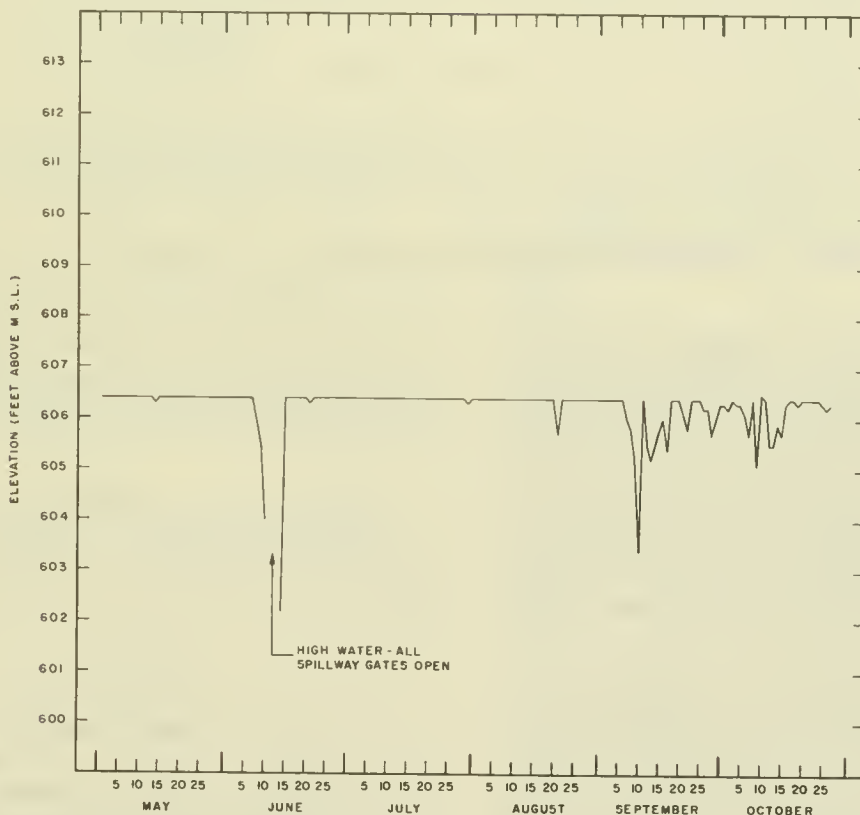


Figure 1.--Headwater elevations, Rock Island Dam, May 1 to October 27, 1961.



Figure 2.--Tailwater elevations, Rock Island Dam, May 1 to October 27, 1961.

As in past years of counting at Rock Island Dam, some fish were observed with cuts or abrasions on the body. Of 40,764 fish examined as they passed over the counting boards, approximately 1.06 percent had injuries of some type either on the body or about the head. Since the counters could see only the top and one side of the fish, the incidence of injury was probably greater than indicated. In period May 1 to July 5 all fish were quite free of injuries. Greatest numbers of injuries were observed during July and August and were most numerous on large chinook and sockeye salmon (table 21). In period July 20 to August 12 counters reported a number of fish with similar injuries. The injury most commonly observed was a circular cut or abrasion about 1 inch in diameter, usually along the side of the fish. Some of these injuries

were newly made as evidenced by the presence of bloody tissue. Others appeared to have been made much earlier as scar tissue was forming.

During extreme high water period June 10-13 a considerable quantity of gravel, silt, and debris was deposited in the right bank fish ladder.

On July 19 counting facilities at left fish ladder were operated from 9:30 p.m. to 11:45 p.m. Between 9:30 p.m. and 9:45 p.m. two chinook and two sockeye salmon passed over the counting board. From 9:45 p.m. to 11:45 p.m. there was no movement of fish observed.

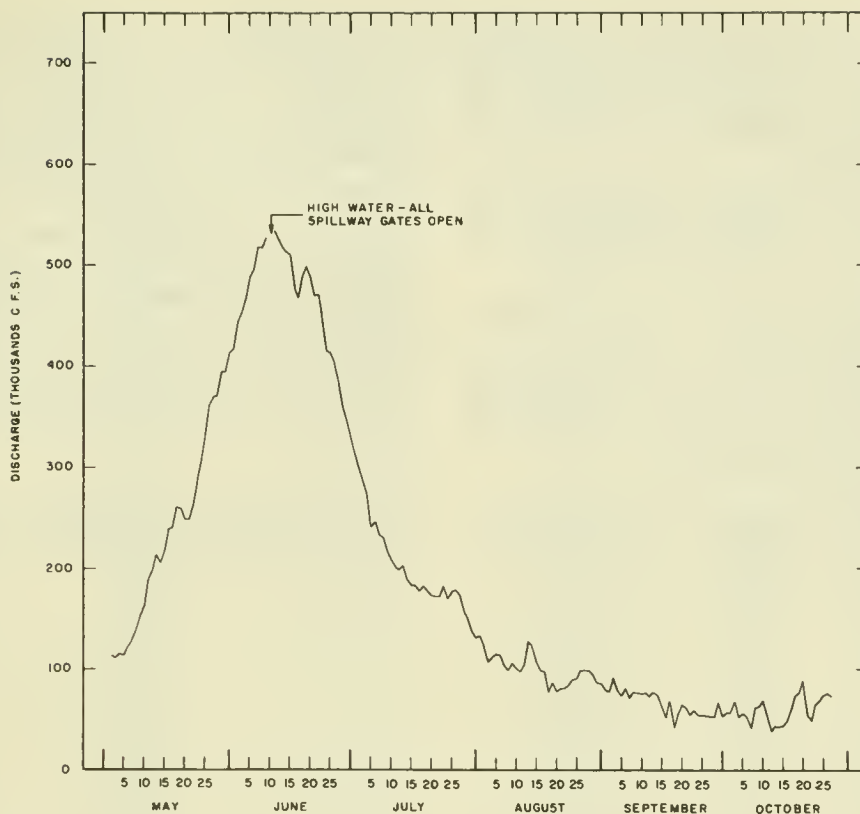


Figure 3.--Daily river discharge, Rock Island Dam, May 1 to October 27, 1961.

The six times that dewatering of fishways at Rock Island Dam occurred in 1961 were as follows:

1. Left fish ladder, from 10 p.m. on May 3 to 1 p.m. on May 5, to install electronic counting equipment.

2. Right fish ladder, from 10 a.m. to 3 p.m. on June 5, to clean ladder orifices and repair telescopic gate chains.

3. Right fish ladder, from 12:45 p.m. to 2:40 p.m. on June 7, to complete ladder repairs.

4. All three fish ladders, from 1 p.m. on June 9 to start of counting on June 14, were inoperative due to high water.

5. Right fish ladder, from 11 a.m. to 3:15 p.m. on June 29, to replace stoplogs lost during high water period.

6. Right fish ladder, from 12:50 p.m. to 2:40 p.m. on July 5, to repair broken gate chain.

SUMMARY

1. The total Rock Island Dam count of salmon and steelhead in 1961 was 59,392, which was slightly more than half the 1960 count of 93,183.

2. Yearly total counts of salmon and steelhead passing Rock Island Dam during the period 1933-61, inclusive, are given in table 1.

3. The chinook salmon count of 33,067 in 1961 was greater than in 1960 and slightly more than half the peak year of 1957. In 1961, 9,260 jacks were recorded, representing 28.0 percent of that year's total chinook salmon counted.

4. The sockeye count of 19,233 was slightly less than one-third the 1960 count of 60,341 and considerably less than the 28-year mean of 53,079. A greater percentage of sockeye salmon utilized the left bank ladder than used either the middle or right bank ladders. In 1961, sockeye salmon under 16 inches in length comprised 18.2 percent of the count.

5. Very few coho salmon have appeared at Rock Island Dam in the period 1933-61. The greatest count, 229, occurred in 1947. The 1961 count of 50 fish was slightly more than half the 1960 count.

6. The steelhead count of 7,042 in 1961 exceeded the 28-year mean of 3,063 and was the highest recorded in the period 1933-61.

7. Fish counting in 1961 began on May 1 and terminated October 27. From May 1 to August 19 counting was conducted for 16 hours each day; from August 20 to September 30, 14 hours each day; and from October 1 to October 27, 8 hours each day.

8. In 1961 the maximum number of salmonids counted in one day (1,651) was on July 14.

9. Season's total of fish other than salmon and steelhead trout passing Rock Island Dam in 1961 was 140,173, and was composed of the following: sucker, 76,797; squawfish, 15,174; whitefish, 23,124; chub, 6,754; and "other fish," composed largely of lamprey and carp, 18,324.

10. Of 40,764 fish examined, on the top and one side only, as they passed over the counting boards, approximately 1.06 percent had injuries of some type either on the body or about the head. Greatest numbers of injured fish occurred in July and August. Injuries were most numerous on large chinook and sockeye salmon.

11. High water conditions at Rock Island Dam made the fish ladders inoperative from June 9 to 13, inclusive.

Table 1.--Annual counts of salmon and steelhead trout at Rock Island Dam, 1933-61.

Year	Chinook salmon	Steelhead trout	Sockeye salmon	Coho salmon	Total
1933	5,668 ^{1/}	1,055 ^{1/}	40,737	182	47,642
1934	6,482 ^{1/}	583	2,227	69	9,361
1935	16,310 ^{1/}	5,412 ^{1/}	14,013	10	35,745
1936	7,396 ^{1/}	2,369 ^{1/}	16,501	0	26,266
1937	5,133	2,214 ^{1/}	15,089	58	22,494
1938	5,803	2,400 ^{1/}	17,123	78	25,404
1939	11,206	5,427 ^{1/}	19,591	13	36,237
1940	9,492	5,550	26,894	2	41,938
1941	2,571	3,561	949	29	7,110
1942	6,814	3,586	16,282	1	26,683
1943	11,145	2,249	17,665	22	31,081
1944	3,375	1,329	4,932	186	9,822
1945	5,696	1,121	7,142	166	14,125
1946	9,992	1,761	45,029	32	56,814
1947	11,766	2,115	79,834	229	93,944
1948	7,083	2,360	84,184	29	93,656
1949	12,353	2,470	18,600	40	33,463
1950	10,348	1,852	50,134	72	62,406
1951	18,752	3,121	101,826	8	123,707
1952	20,121	2,883	114,349	27	137,380
1953	31,080	4,001	151,747	40	186,868
1954	33,283	5,407	91,234	44	129,968
1955	25,658	3,141	155,055	39	183,893
1956	25,085	1,540	92,443	29	119,097
1957	50,713	3,927	71,261	27	125,928
1958 ^{2/}	32,457	3,970	98,695	60	135,182
1959 ^{2/}	23,352	4,138	72,351	118	99,959
1960	26,550	6,226	60,341	94	93,211
1961	33,067	7,042	19,233	50	59,392

¹ Incomplete count.

² Counts for the period from May 4 through July 15, 1959 were computed by extrapolating sample counts.

Table 2.--Monthly totals of all anadromous fish counted at Rock Island Dam, 1961.

Species	May	June	July	August	Sept.	Oct.	Total
Chinook	4,520	2,151	5,720	6,413	4,363	640	23,807
Chinook (jacks)	450	960	934	3,094	3,409	413	9,260
Steelhead	295	22	167	931	3,508	2,119	7,042
Sockeye (large)	16	164	12,472	3,026	56	2	15,736
Sockeye (small)	3	48	2,487	956	3	0	3,497
Coho	0	0	0	0	19	31	50
Total fish	5,284	3,345	21,780	14,420	11,358	3,205	59,392

Table 3.--Maximum daily counts, salmon and steelhead, Rock Island Dam, 1961.

Species	Date	Number of fish
Chinook (except jacks)	Aug. 7	692
Chinook (jacks)	Sept. 18	199
Steelhead	Sept. 19	269
Sockeye (large)	July 14	1,133
Sockeye (small)	July 21	190
Coho	Oct. 4	8

Table 4.--Number and percent of chinook salmon counted over each fish ladder, Rock Island Dam, 1961

(jacks not included).

Date		Left ladder		Middle ladder		Right ladder		Total
		Number	Percent	Number	Percent	Number	Percent	
May	1-15	872	33.3	672	25.7	1,075	41.0	2,619
May	16-31	290	15.3	1,324	69.7	287	15.0	1,901
June	1-15	570	44.0	463	35.7	262	20.3	1,295
June	16-30	312	36.5	123	14.4	421	49.1	856
July	1-15	2,023	64.6	220	7.0	890	28.4	3,133
July	16-31	1,996	77.1	48	1.9	543	21.0	2,587
Aug.	1-15	4,100	89.2	324	7.1	172	3.7	4,596
Aug.	16-31	1,345	74.0	83	4.6	389	21.4	1,817
Sept.	1-15	1,140	65.5	160	9.3	438	25.2	1,738
Sept.	16-30	1,760	67.0	113	4.4	752	28.6	2,625
Oct.	1-15	285	56.3	70	13.8	151	29.9	506
Oct.	16-27	77	57.4	9	6.7	48	35.9	134
Total		14,770	62.0	3,609	15.2	5,428	22.8	23,807

Table 5.--Number and percent of chinook salmon jacks counted over each fish ladder, Rock Island Dam, 1961.

Date		Left ladder		Middle ladder		Right ladder		Total
		Number	Percent	Number	Percent	Number	Percent	
May	1-15	42	19.4	84	38.9	90	41.7	216
May	16-31	54	23.1	123	52.6	57	24.3	234
June	1-15	189	44.7	63	14.9	171	40.4	423
June	16-30	272	50.7	54	10.0	211	39.3	537
July	1-15	202	51.5	54	13.8	136	34.7	392
July	16-31	349	64.4	36	6.6	157	29.0	542
Aug.	1-15	1,062	83.3	146	11.4	67	5.3	1,275
Aug.	16-31	1,604	88.1	63	3.5	152	8.4	1,819
Sept.	1-15	1,622	86.3	85	4.6	171	9.1	1,878
Sept.	16-30	1,267	82.9	59	3.9	203	13.2	1,531
Oct.	1-15	292	88.0	13	3.9	27	8.1	332
Oct.	16-27	64	79.0	1	1.0	16	20.0	81
Total		7,019	75.8	781	8.4	1,460	15.8	9,260

Table 6.--Number and percent of sockeye salmon (large) counted over each ladder, Rock Island Dam, 1961.

Date		Left ladder		Middle ladder		Right ladder		Total
		<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	
May	1-15	0	0	0	0	0	0	0
May	16-31	4	25.0	11	68.0	1	7.0	16
June	1-15	22	44.0	10	20.0	18	36.0	50
June	16-30	72	63.2	1	0.8	41	36.0	114
July	1-15	2,295	62.0	361	9.8	1,045	28.2	3,701
July	16-31	5,636	64.3	680	7.7	2,455	28.0	8,771
Aug.	1-15	1,765	71.6	471	19.1	229	9.3	2,465
Aug.	16-31	377	67.2	54	9.6	130	23.2	561
Sept.	1-15	27	65.9	3	7.3	11	26.8	41
Sept.	16-30	14	93.0	0	0	1	7.0	15
Oct.	1-15	2	100.0	0	0	0	0	2
Oct.	16-27	0	0	0	0	0	0	0
Total		10,214	64.9	1,591	10.1	3,931	25.0	15,736

Table 7.--Number and percent of sockeye salmon (small) counted over each ladder, Rock Island Dam, 1961.

Date		Left ladder		Middle ladder		Right ladder		Total
		<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	
May	1-15	0	0	0	0	0	0	0
May	16-31	1	33.0	2	67.0	0	0	3
June	1-15	10	50.0	3	15.0	7	35.0	20
June	16-30	10	35.7	0	0	18	64.3	28
July	1-15	427	65.4	66	10.0	161	24.6	654
July	16-31	1,238	67.6	118	6.4	477	26.0	1,833
Aug.	1-15	645	77.0	107	12.8	85	10.2	837
Aug.	16-31	75	63.0	19	16.0	25	21.0	119
Sept.	1-15	3	100.0	0	0	0	0	3
Sept.	16-30	0	0	0	0	0	0	0
Oct.	1-15	0	0	0	0	0	0	0
Oct.	16-27	0	0	0	0	0	0	0
Total		2,409	68.9	315	9.0	773	22.1	3,497

Table 8.--Number and percent of steelhead trout counted over each ladder, Rock Island Dam, 1961.

Date		Left ladder		Middle ladder		Right ladder		Total
		<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	
May	1-15	82	35.5	42	18.2	107	46.3	231
May	16-31	17	25.5	30	47.0	17	25.5	64
June	1-15	5	38.5	7	53.8	1	7.7	13
June	16-30	4	44.4	4	44.5	1	11.1	9
July	1-15	21	65.7	2	6.2	9	28.1	32
July	16-31	108	80.0	2	1.5	25	18.5	135
Aug.	1-15	358	77.0	52	11.2	55	11.8	465
Aug.	16-31	332	71.2	27	5.8	107	23.0	466
Sept.	1-15	807	83.8	71	7.4	85	8.8	963
Sept.	16-30	1,864	73.2	327	12.8	354	14.0	2,545
Oct.	1-15	1,131	77.5	230	15.7	99	6.8	1,460
Oct.	16-27	528	80.1	61	9.3	70	10.6	659
Total		5,257	74.7	855	12.1	930	13.2	7,042

Table 9.--Daily temperatures, stream flow, and fish count data, Rock Island Dam, May 1961.

Date	Air temperatures ^{1/}		Water temperature ^{2/}	Stream flow (c.f.s.)	Chinook	Sockeye	Coho	Steelhead	Total
	Max.	Min.							
May 1	59	51	49	--	137	0	0	44	181
2	53	51	47	113,300	158	0	0	42	200
3	53	48	48	110,900	140	0	0	24	164
4	52	48	48	115,000	86	0	0	3	89
5	48	48	48	112,500	175	0	0	23	198
6	70	53	48	121,600	257	0	0	11	268
7	65	53	47	125,800	331	0	0	18	349
8	60	54	48	137,200	259	0	0	10	269
9	55	50	48	151,800	116	0	0	10	126
10	59	48	48	178,000	130	0	0	6	136
11	59	41	48	187,800	79	0	0	5	84
12	72	51	48	198,000	173	0	0	8	181
13	59	52	49	212,600	489	0	0	15	504
14	70	51	49	205,800	152	0	0	2	154
15	78	53	50	216,600	153	0	0	10	163
16	78	53	50	239,000	227	0	0	9	236
17	82	51	50	241,000	187	0	0	4	191
18	76	50	50	260,900	220	0	0	7	227
19	82	51	50	258,900	131	0	0	5	136
20	--	--	51	249,000	161	0	0	7	168
21	83	55	51	249,000	256	0	0	12	268
22	78	52	51	262,200	100	0	0	2	102
23	76	56	51	285,800	116	0	0	3	119
24	74	46	51	308,100	72	0	0	1	73
25	86	50	52	330,200	143	3	0	2	148
26	68	56	51	360,800	171	0	0	3	174
27	72	52	51	369,400	61	0	0	0	61
28	72	60	51	371,000	60	0	0	3	63
29	71	58	51	394,900	71	6	0	1	78
30	71	58	51	394,900	67	5	0	2	74
31	76	58	52	413,600	92	5	0	3	100

¹ Air temperatures, taken with pocket thermometer, are given in degrees Fahrenheit.² Water temperatures, taken with recording thermometer at center ladder, are given in degrees Fahrenheit.

Table 10.---Daily temperatures, stream flow, and fish count data, Rock Island Dam, June 1961.

Date	Air temperatures ^{1/}		Water temperature ^{2/}	Stream flow (c.f.s.)	Chinook	Sockeye	Coho	Steelhead	Total
	Max.	Min.							
June 1	87	60	53	417,400	288	13	0	6	307
2	88	60	53	444,500	95	10	0	1	106
3	88	66	54	452,300	49	11	0	1	61
4	87	63	54	466,000	49	7	0	2	58
5	84	62	54	488,500	42	2	0	2	46
6	76	54	54	496,100	20	4	0	0	24
7	74	50	54	517,900	10	2	0	0	12
8	76	50	54	517,400	17	6	0	0	23
9	76	50	54	528,000	2	1	0	0	3
10	--	--	--	--	--	--	--	--	--
11	--	--	--	534,900	--	--	--	--	--
12	--	--	--	526,900	--	--	--	--	--
13	--	--	--	518,600	--	--	--	--	--
14	93	60	56	513,300	924	6	0	0	930
15	96	67	56	510,000	222	8	0	1	231
16	100	70	57	477,000	131	4	0	2	137
17	100	75	57	467,700	157	0	0	0	157
18	92	68	57	490,000	82	2	0	1	85
19	93	68	56	499,300	117	14	0	0	131
20	87	64	56	487,100	113	6	0	0	119
21	85	58	56	470,500	77	7	0	1	85
22	90	58	56	471,200	44	4	0	0	48
23	95	56	57	447,500	63	4	0	0	67
24	96	68	57	415,500	76	1	0	1	78
25	91	72	57	413,600	73	6	0	1	80
26	78	70	58	404,200	69	17	0	1	87
27	85	54	58	383,900	69	8	0	0	77
28	85	60	58	360,800	68	17	0	1	86
29	74	60	59	345,300	93	20	0	0	113
30	85	51	59	331,800	161	32	0	1	194

¹ Air temperatures, taken with pocket thermometer, are given in degrees Fahrenheit.² Water temperatures, taken with recording thermometer at center ladder, are given in degrees Fahrenheit.

Table 11.--Daily temperatures, stream flow, and fish count data, Rock Island Dam, July 1961.

Date	Air temperatures ^{1/}		Water temperature ^{2/}	Stream flow (c.f.s.)	Chinook	Sockeye	Coho	Steelhead	Total
	Max.	Min.							
July 1	80	59	59	313,400	158	38	0	0	196
2	89	60	59	299,200	153	35	0	0	188
3	89	60	59	287,700	198	34	0	0	232
4	96	70	60	274,800	167	48	0	0	215
5	81	68	60	241,500	252	68	0	0	320
6	82	58	60	245,700	218	107	0	1	326
7	79	55	60	234,700	311	109	0	1	421
8	88	64	60	230,000	355	141	0	3	499
9	90	67	60	216,600	242	168	0	3	413
10	95	64	61	208,500	220	153	0	1	374
11	98	67	61	200,500	197	302	0	1	500
12	103	72	61	199,200	210	335	0	4	549
13	104	74	62	201,800	288	543	0	4	835
14	90	78	62	184,100	357	1,289	0	5	1,651
15	91	72	62	182,900	199	985	0	9	1,193
16	83	74	62	182,900	122	641	0	3	766
17	90	66	63	176,900	74	429	0	0	503
18	92	66	63	181,700	113	654	0	1	768
19	95	68	63	176,900	170	799	0	7	976
20	105	74	63	173,400	215	649	0	5	869
21	101	78	63	172,300	272	1,063	0	9	1,344
22	95	78	64	172,300	192	967	0	2	1,161
23	88	75	64	181,700	131	911	0	4	1,046
24	87	65	65	170,000	253	757	0	3	1,013
25	88	63	65	176,900	254	619	0	10	883
26	91	67	65	179,200	220	553	0	10	783
27	92	72	65	173,400	216	612	0	6	834
28	84	66	65	156,900	229	610	0	15	854
29	86	60	65	149,800	162	497	0	31	690
30	90	61	65	137,200	289	380	0	17	686
31	95	67	64	130,100	217	463	0	12	692

¹ Air temperatures, taken with pocket thermometer, are given in degrees Fahrenheit.² Water temperatures, taken with recording thermometer at center ladder, are given in degrees Fahrenheit.

Table 12.---Daily temperatures, stream flow, and fish count data, Rock Island Dam, August 1961.

Date	Air temperatures ^{1/}		Water temperature ^{2/}	Stream flow (c.f.s.)	Chinook	Sockeye	Coho	Steelhead	Total
	Max.	Min.							
Aug. 1	95	69	64	133,600	492	324	0	9	825
2	103	68	64	124,100	275	266	0	6	547
3	103	70	64	106,300	253	387	0	12	652
4	108	71	65	111,700	473	417	0	33	923
5	86	76	64	115,000	704	359	0	36	1,099
6	90	63	64	114,100	301	207	0	28	536
7	94	67	64	104,800	775	261	0	59	1,095
8	94	68	65	99,800	515	309	0	41	865
9	92	67	65	105,600	443	183	0	21	647
10	94	61	65	100,500	381	112	0	33	526
11	96	61	65	98,400	306	131	0	41	478
12	98	61	65	104,800	159	149	0	30	338
13	88	66	65	127,500	455	100	0	53	608
14	100	70	65	124,100	145	53	0	31	229
15	92	70	65	107,900	294	44	0	32	370
16	85	62	65	99,800	361	63	0	39	463
17	85	62	66	97,700	227	51	0	32	320
18	95	60	66	77,100	427	90	0	47	564
19	100	65	66	87,500	167	112	0	29	308
20	98	79	66	78,400	163	38	0	33	234
21	90	67	67	80,300	226	74	0	25	325
22	99	67	66	80,300	184	67	0	35	286
23	102	74	66	84,200	155	34	0	21	210
24	85	70	66	90,000	165	46	0	38	249
25	88	58	66	90,200	285	34	0	21	340
26	85	60	66	98,400	237	24	0	39	290
27	86	62	66	99,800	209	10	0	15	234
28	90	62	66	98,400	199	6	0	27	232
29	92	62	66	94,900	170	13	0	20	203
30	88	67	66	86,200	196	14	0	17	227
31	79	67	66	85,500	165	4	0	28	197

¹ Air temperatures, taken with pocket thermometer, are given in degrees Fahrenheit.² Water temperatures, taken with recording thermometer at center ladder, are given in degrees Fahrenheit.

Table 13.--Daily temperatures, stream flow, and fish count data, Rock Island Dam, September 1961.

Date	Air temperatures ^{1/}		Water temperature ^{2/}	Stream flow (c.f.s.)	Chinook	Sockeye	Coho	Steelhead	Total
	Max.	Min.							
Sept. 1	67	53	66	79,700	270	3	0	30	303
2	74	56	65	77,100	229	6	0	25	260
3	85	60	65	90,900	227	3	0	27	257
4	89	66	65	79,100	220	1	0	35	256
5	76	64	65	74,600	261	2	0	32	295
6	76	50	65	80,300	238	1	0	31	270
7	77	54	65	70,200	173	4	0	42	219
8	80	48	65	76,500	289	4	0	70	363
9	85	58	65	75,900	197	1	0	82	280
10	85	58	65	75,200	177	2	0	56	235
11	80	53	65	76,500	239	2	1	68	310
12	74	52	65	73,400	269	3	1	81	354
13	79	50	65	77,100	252	0	0	138	390
14	78	50	64	73,400	350	5	1	151	507
15	82	56	64	62,200	225	7	0	95	327
16	85	59	64	51,200	272	0	0	76	348
17	87	59	65	68,500	645	3	0	190	838
18	80	58	65	42,000	633	1	0	234	868
19	78	56	65	56,000	412	3	1	269	685
20	65	50	64	65,000	362	2	0	240	604
21	72	39	64	61,600	260	1	0	171	432
22	70	42	64	54,900	312	0	0	214	526
23	68	43	63	59,400	245	0	3	172	420
24	75	44	64	54,900	165	0	2	154	321
25	75	54	63	54,900	127	1	2	114	244
26	65	42	63	54,300	98	0	1	90	189
27	66	50	63	53,200	159	0	0	136	295
28	59	50	62	52,200	161	2	0	160	323
29	59	42	62	65,600	173	0	6	175	354
30	70	50	62	54,300	132	2	1	150	285

¹ Air temperatures, taken with pocket thermometer, are given in degrees Fahrenheit.² Water temperatures, taken with recording thermometer at center ladder, are given in degrees Fahrenheit.

Table 14.--Daily temperatures, stream flow, and fish count data, Rock Island Dam, October 1961.

Date	Air temperatures ¹		Water temperature ²	Stream flow (c.f.s.)	Chinook	Sockeye	Coho	Steelhead	Total
	Max.	Min.							
Oct. 1	67	44	62	56,000	71	0	2	61	134
2	75	42	62	56,600	90	2	1	79	172
3	75	42	62	67,900	128	0	3	114	245
4	73	43	62	54,300	76	0	8	128	212
5	74	54	62	55,400	75	0	1	106	182
6	58	54	62	53,200	73	0	3	113	189
7	58	39	61	41,400	43	0	0	140	183
8	62	39	61	62,200	62	0	3	139	205
9	61	41	61	62,700	60	0	1	124	185
10	62	50	60	67,900	35	0	1	99	135
11	59	43	60	53,300	37	0	0	87	124
12	55	42	59	38,000	22	0	0	38	60
13	75	45	60	44,300	18	0	0	49	67
14	73	45	60	43,500	20	0	0	88	108
15	74	48	60	43,900	28	0	1	95	124
16	68	48	60	47,800	26	0	0	94	120
17	65	42	60	58,800	24	0	2	31	57
18	58	35	60	74,600	13	0	0	43	56
19	60	34	60	77,100	34	0	1	82	117
20	56	34	59	87,800	33	0	0	78	111
21	54	38	59	54,900	17	0	0	72	89
22	56	34	58	49,700	17	0	0	59	76
23	54	32	58	65,600	16	0	1	45	62
24	56	33	58	69,000	17	0	1	36	54
25	54	38	57	74,000	8	0	1	43	52
26	58	38	57	75,200	6	0	1	45	52
27	53	39	57	74,000	4	0	0	31	35

¹ Air temperatures, taken with pocket thermometer, are given in degrees Fahrenheit.

² Water temperatures, taken with recording thermometer at center ladder, are given in degrees Fahrenheit.

Table 15.--Miscellaneous fish count, Rock Island Dam, May 1961.

Date	Sucker	Squawfish	Whitefish	Chub	Dolly Varden	Rainbow trout	Other ^{1/}	Total
May								
1	178	3	62	6	0	0	0	249
2	37	32	24	10	0	0	0	103
3	23	0	57	10	0	0	0	90
4	13	2	16	1	0	0	0	32
5	54	16	116	9	0	0	0	195
6	16	19	56	0	0	0	0	91
7	19	17	28	0	0	0	0	64
8	8	8	24	0	0	0	0	40
9	27	12	55	0	0	0	0	94
10	40	19	49	0	0	0	0	108
11	45	16	31	0	0	0	0	92
12	111	44	54	10	0	0	0	219
13	582	127	88	57	0	0	0	854
14	283	45	31	13	0	0	0	372
15	129	78	42	15	0	0	0	264
16	551	195	79	50	0	0	0	875
17	766	35	98	9	0	0	0	908
18	395	110	104	48	0	0	0	657
19	203	55	47	46	0	0	0	354
20	187	81	42	22	0	1	2	332
21	171	71	30	15	0	0	0	287
22	85	36	26	9	0	0	0	156
23	50	15	9	3	0	0	0	77
24	35	18	6	3	0	0	0	62
25	54	32	18	3	0	0	0	107
26	104	39	49	28	0	0	0	220
27	47	6	7	1	0	0	0	61
28	22	4	4	0	1	0	0	31
29	38	9	14	2	0	0	0	63
30	20	8	2	1	0	0	0	31
31	32	9	4	1	0	0	0	46
Total	4,325	1,161	1,272	372	1	1	2	7,134

¹ Principally carp and lamprey.

Table 16.---Miscellaneous fish count, Rock Island Dam, June 1961.

Date	Sucker	Squawfish	Whitefish	Chub	Dolly Varden	Rainbow trout	Other ^{1/}	Total
June 1	60	46	4	20	0	0	0	130
2	52	43	12	21	0	0	0	128
3	40	18	9	6	0	0	2	75
4	36	5	3	5	0	0	1	50
5	15	7	2	2	0	0	0	26
6	17	7	2	0	0	0	0	26
7	5	1	0	1	0	0	0	7
8	8	7	0	0	0	1	0	16
9	3	0	0	0	0	0	0	3
10	---	---	---	---	---	---	---	---
11	---	---	---	---	---	---	---	---
12	---	---	---	---	---	---	---	---
13	---	---	---	---	---	---	---	---
14	234	28	0	28	0	0	0	290
15	136	19	3	0	0	0	2	160
16	157	84	5	6	0	0	2	254
17	273	94	1	15	0	0	2	385
18	179	21	0	5	0	0	1	206
19	92	13	0	4	0	0	1	110
20	101	7	0	2	0	0	1	110
21	74	9	0	0	0	0	0	84
22	100	15	0	0	0	0	1	116
23	118	51	8	1	0	0	0	181
24	177	199	9	2	0	0	2	394
25	357	65	5	2	0	0	0	429
26	451	140	9	26	0	1	3	630
27	187	104	1	4	0	0	1	297
28	874	359	8	5	0	0	4	1,250
29	897	257	2	0	0	0	18	1,174
30	575	238	1	11	0	0	20	845
	5,218	1,837	84	174	0	2	61	7,376

¹ Principally carp and lamprey.

Table 17.--Miscellaneous fish count, Rock Island Dam, July 1961.

Date	Sucker	Squawfish	Whitefish	Chub	Dolly Varden	Rainbow trout	Other ^{1/}	Total
July 1	1,093	366	23	13	0	0	29	1,524
2	875	364	12	6	0	0	68	1,325
3	502	288	27	9	0	0	73	899
4	972	259	8	12	0	0	57	1,308
5	961	171	10	13	0	0	77	1,232
6	359	88	4	11	1	0	53	516
7	131	71	13	8	0	0	83	306
8	264	229	8	4	0	0	62	567
9	408	130	19	11	0	0	85	653
10	655	186	10	13	0	0	96	960
11	799	230	6	10	0	0	48	1,093
12	602	126	10	9	0	0	101	848
13	603	74	8	8	0	0	64	757
14	238	94	15	10	0	0	83	440
15	185	81	30	10	0	0	62	368
16	120	75	34	5	0	0	96	330
17	108	91	20	8	0	0	105	332
18	153	89	14	6	0	0	55	317
19	159	117	28	9	0	0	67	380
20	131	112	23	5	0	0	64	335
21	119	109	23	12	2	0	94	359
22	225	185	20	8	0	0	77	515
23	423	170	18	4	0	0	101	716
24	127	50	23	3	0	0	84	287
25	427	102	24	11	0	0	100	664
26	565	92	16	9	1	0	110	793
27	537	142	29	15	0	0	213	936
28	403	148	19	36	0	0	235	841
29	309	127	28	18	0	0	129	611
30	1,081	139	28	3	0	0	117	1,368
31	440	77	55	5	0	0	118	695
	13,974	4,582	605	304	4	0	2,806	22,275

¹ Principally carp and lamprey.

Table 18.--Miscellaneous fish count, Rock Island Dam, August 1961.

Date	Sucker	Squawfish	Whitefish	Chub	Dolly Varden	Rainbow trout	Other ¹ / _l	Total
Aug. 1	632	84	45	19	0	2	58	840
2	176	46	31	6	0	2	72	333
3	493	103	52	4	0	0	114	766
4	739	111	36	7	0	0	232	1,125
5	1,187	89	44	63	0	0	173	1,556
6	463	36	25	28	0	1	119	672
7	509	73	40	17	2	0	149	790
8	677	81	23	17	1	0	145	944
9	1,183	103	39	24	0	0	126	1,475
10	385	71	61	16	0	0	351	884
11	317	77	37	26	0	0	399	856
12	991	130	21	71	0	0	762	1,975
13	452	120	47	33	0	0	1,551	2,204
14	501	96	48	36	1	0	1,296	1,978
15	417	85	57	53	0	0	706	1,318
16	612	128	42	53	0	0	823	1,658
17	594	153	22	118	0	0	1,852	2,739
18	789	107	38	59	0	0	1,343	2,336
19	1,027	174	46	48	0	0	1,140	2,435
20	926	121	61	37	0	0	518	1,663
21	1,158	133	40	31	0	0	316	1,678
22	945	107	81	51	0	0	312	1,496
23	980	98	44	14	0	0	174	1,310
24	1,067	90	40	34	0	0	213	1,444
25	616	63	47	35	0	0	98	859
26	1,002	233	64	87	0	0	76	1,462
27	1,036	213	55	92	0	0	106	1,502
28	1,051	173	58	193	0	0	92	1,567
29	705	248	40	203	0	0	99	1,295
30	1,001	208	51	241	0	1	72	1,574
31	503	131	65	226	0	0	129	1,054
	23,135	3,685	1,400	1,942	4	6	13,616	43,788

¹ Principally carp and lamprey.

Table 19.--Miscellaneous fish count, Rock Island Dam, September 1961.

Date	Sucker	Squawfish	Whitefish	Chub	Dolly Varden	Rainbow trout	Other ¹	Total
Sept. 1	557	101	36	138	0	5	67	904
2	564	119	35	50	0	0	101	869
3	795	115	68	102	0	0	121	1,201
4	311	102	50	112	0	0	100	675
5	591	93	35	51	0	0	128	898
6	817	91	35	37	0	0	88	1,068
7	723	96	36	91	0	0	121	1,067
8	460	111	34	70	0	2	31	708
9	537	121	55	13	0	0	62	788
10	757	87	39	86	0	0	148	1,117
11	1,773	130	51	94	0	0	78	2,126
12	1,301	102	69	127	0	0	94	1,693
13	1,248	99	48	141	0	0	23	1,559
14	1,167	95	85	136	0	0	76	1,559
15	511	88	65	112	0	0	81	857
16	1,563	189	64	73	0	0	41	1,930
17	1,127	97	71	69	0	0	51	1,415
18	920	77	118	105	0	0	22	1,242
19	1,758	127	120	71	0	0	22	2,098
20	1,438	92	168	143	0	0	31	1,872
21	526	64	181	94	0	0	33	898
22	704	79	220	98	0	0	10	1,111
23	1,169	126	379	122	0	0	13	1,809
24	1,372	178	475	220	0	0	4	2,249
25	705	312	601	423	0	0	25	2,066
26	549	205	920	451	0	0	23	2,148
27	627	95	490	341	0	0	32	1,585
28	451	169	537	190	0	0	37	1,384
29	1,039	83	609	40	0	0	29	1,800
30	139	47	510	17	0	0	16	729
	26,199	3,490	6,204	3,817	0	7	1,708	41,425

¹ Principally carp and lamprey.

Table 20.--Miscellaneous fish count, Rock Island Dam, October 1961.

Date	Sucker	Squawfish	Whitefish	Chub	Dolly Varden	Rainbow trout	Other ¹ / ₂	Total
Oct. 1	65	24	366	8	0	0	11	474
2	94	31	369	6	0	0	10	510
3	449	30	275	7	0	0	7	768
4	181	22	174	0	0	0	10	387
5	77	9	148	4	0	0	4	242
6	96	11	152	6	0	0	5	270
7	70	9	156	3	0	0	1	239
8	267	16	142	5	0	0	0	430
9	257	9	226	0	0	0	2	494
10	384	36	153	4	0	0	6	583
11	96	14	240	10	0	0	5	365
12	217	33	227	9	0	0	0	486
13	122	9	366	0	0	0	2	499
14	83	21	527	2	0	0	2	635
15	154	21	497	0	0	0	1	673
16	252	20	534	5	0	0	1	812
17	143	6	739	5	0	0	2	895
18	132	27	1,003	4	0	0	3	1,169
19	287	29	856	6	0	0	4	1,182
20	277	25	1,638	1	0	0	1	1,942
21	136	11	1,071	3	0	0	2	1,223
22	89	11	811	3	0	0	1	915
23	322	24	582	4	0	0	3	935
24	115	2	635	4	0	0	1	757
25	62	11	402	0	0	0	1	476
26	65	7	384	0	0	0	0	456
27	53	9	406	0	0	0	0	468
	4,545	477	13,079	99	0	0	85	18,285

¹ Principally carp and lamprey.

Table 21.--Injured fish observed at Rock Island Dam, July 19-October 27, 1961.

Date	Species	Total fish counted	Injured fish observed			Total injured fish
			Left ladder	Center ladder	Right ladder	
July 19-29	Chinook	1,878	35	0	7	42
	Jacks	436	1	0	0	1
	Sockeye	8,037	49	0	10	59
	Steelhead	102	1	0	0	1
July 30-Aug. 12	Chinook	4,486	50	7	6	63
	Jacks	997	3	0	0	3
	Sockeye	3,948	93	3	1	97
	Steelhead	378	2	0	0	2
Aug. 13-26	Chinook	2,045	42	2	8	52
	Jacks	1,546	4	1	0	5
	Sockeye	830	20	1	0	21
	Steelhead	475	0	0	0	0
Aug. 27-Sept. 9	Chinook	1,332	30	3	7	40
	Jacks	1,711	2	0	0	2
	Sockeye	72	1	0	1	2
	Steelhead	481	0	0	0	0
Sept. 10-23	Chinook	2,843	10	4	1	15
	Jacks	1,810	1	0	0	1
	Sockeye	29	1	0	0	1
	Steelhead	2,155	4	0	0	4
Sept. 24-Oct. 7	Chinook	856	5	0	0	5
	Jacks	715	0	0	0	0
	Sockeye	7	0	0	0	0
	Steelhead	1,720	9	0	0	9
Oct. 8-21	Chinook	273	3	0	0	3
	Jacks	156	0	0	0	0
	Sockeye	0	0	0	0	0
	Steelhead	1,119	4	0	0	4
Oct. 22-27	Chinook	41	0	0	0	0
	Jacks	27	0	0	0	0
	Sockeye	0	0	0	0	0
	Steelhead	259	0	0	0	0
Total		40,764	370	21	41	432

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